ASTD Future Deployment Plans

Mound 1998
Ashtabula 1998
West Valley 1998
Nevada 1999/2000
Idaho Nat'l. Eng. and Env. Lab 1999/2000/2001
Brookhaven Nat'l. Lab 2000

Other Deployment Plans

Pantex, SNL, and LANL are considering use of SGS at additional locations.

Operation/Design

- Operation of the system is based upon the gamma energies of the various radionuclides, attenuation of the soils for these energies, and the density of the soil.
- Processing can be done in layers between 0.5 and 2.0 inches thick.
- The system has a variable belt speed between 8.5 and 28.5 cubic yards per hour, which can be adjusted to control the sensitivity required to meet the target remediation goal.

Future Development

- Conveyor belt load capacity will be increased to 65 cubic yards/hour.
- Other sensors may be applied depending upon specific radionuclide requirements.
- Thermo NUtech is working with U.S. EPA to develop a method to characterize naturally occurring radioactive materials containing U, Th, and Ra.

Commercial Availability

SGS is a proprietary technology of Thermo NUtech. They offer a service using the portable equipment, based on a performance-based unit rate.

Contacts

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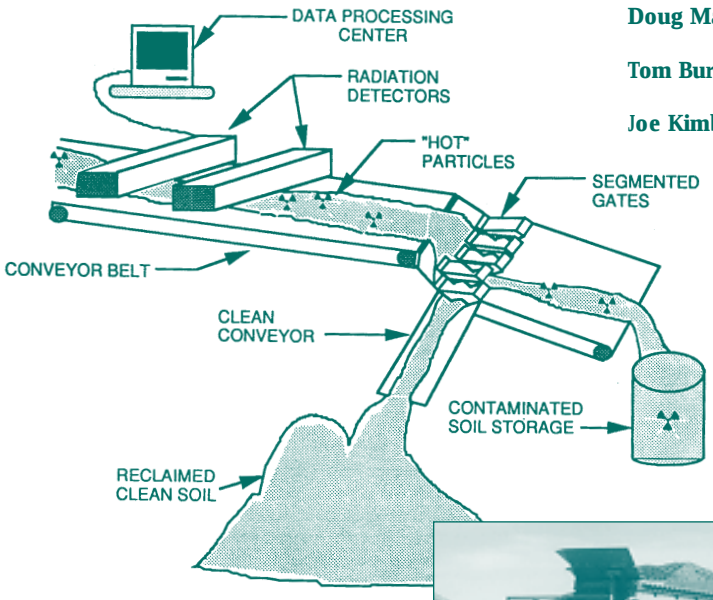


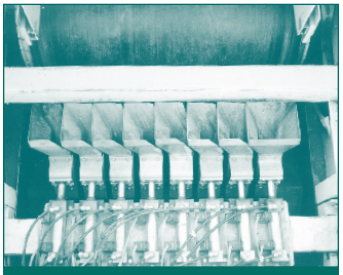
The SGS Process

T E C H N O L O G Y D E P L O Y M E N T

Segmented Gate System (SGS)

August 1998

The Accelerated Site Technology Deployment Program (ASTD) funded 13 competitively selected projects in FY 1998. ASTD helps sponsor the deployment of available innovative technologies to provide valuable cost and performance data. ASTD helps eliminate perceived business risks associated with new technologies, encouraging rapid, multi-site deployment of cost-saving technologies. SGS is one example of ASTD's success, where multiple sites are sharing lessons learned.



Segmented Gates

Regulators from multiple states are participating by site visits and through the Interstate Technology Regulatory Cooperation (ITRC) Metals in Soils Team.

Problem

Accelerating Cleanup Paths to Closure (DOE/EM-0362, 1998) calls for cleanup of more than 90 percent of DOE sites by 2006. The Integrated Data Report (1994) estimates 73 million cubic yards of radioactively-contaminated soils are present at DOE sites across the U.S.

Solution

Thermo NUtech's Segmented Gate System (SGS) characterizes and mechanically separates radioactively-contaminated soils using sodium iodide detectors on a conveyor belt system. SGS significantly reduces the volume of contaminated soils requiring treatment and disposal, enabling large cost savings. The clean soil stream is diverted for return to the site or cheaper disposal options.

Status

SGS has been used at Johnston Atoll (1990-1998), Los Alamos National Laboratory [LANL] (1996), West Valley (1997), Sandia National Laboratory [SNL] (1997 and 1998), Savannah River Site [SRS] (1995), Pantex (1998), New Brunswick FUSRAP, and Nevada Test Site (1998). Additional deployments have already been planned at five other DOE sites (see last page) by 2002. ASTD supports processing of 1,000 cubic yards at each site. Current plans call for 215,000 cubic yards at 8 sites to be processed using SGS for a projected savings of $42M.

Optimum Application

- Soils contaminated with U, Th, Cs, Sr, Am, Pu; one or two radionuclides present.
- Heterogeneous contamination.
- Sites with >500 cubic yards of contaminated soil.

Technology Limitations

- SGS is best suited to sort soil contaminated with no more than two radionuclides with different gamma energies.
- Oversize rocks and cobbles (>2") cannot be processed without precrushing.

Baseline

- The baseline technology is excavation, pretreatment (e.g. moisture control), containerization, transportation, and disposal.
- Baseline technology involves transportation and disposal of significant volumes of uncontaminated soils, thereby raising cleanup costs.

Costs and Cost Savings

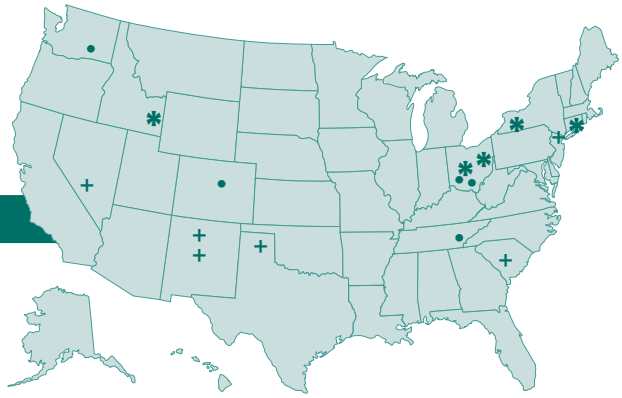
- Costs can be reduced up to 75% over the baseline; savings depend upon the volume of waste treated.
- Baseline costs range from $200 to $1000/cubic yard.
- SGS operational costs range from $55 to $85/cubic yard.
- A major cost factor is whether disposal is on- or off-site. If on-site, costs for long-term monitoring must be included.
- As much as $45 million can be saved for each 100,000 cubic yards of soil processed.

Technology Description

SGS is a transportable radioactivity detection system with a motorized conveyor belt, a variable belt speed controller, air-activated segmented gates, a radionuclide assay computer system, and two arrays of detectors. Excavated soil is fed through a hammer mill for screening and then spread on a conveyor belt and passed under a bank of sensors. Sodium iodide (NaI) detectors have been most commonly used to assay the soils. A computer-controlled mechanical sorter separates the soil into a clean and a contaminated stream. The software supporting the mechanical sorting operation is a key component of the system.

Detector Type	Element of Concern	Lower Detection Limit (pCi/g)*
NaI	Pu239 (Am 241)	3
NaI	Cs137	4
NaI	U238	30
NaI	Th232	3
Beta	Sr90/U238	20

* LDL can vary depending upon background radionuclide contribution.



Key
- \+ Sites where SGS has been deployed or demonstrated
- ✱ Sites committed to deploy SGS
- • Other DOE sites containing radioactively contaminated soils

Performance

Volume reductions range from 30 to over 90 percent.

Site	Element of Concern	Soil Volume Processed (cu yd)	Target Met (pCi/g)	Volume Reduction (%)
Johnston Atoll	Pu239	200,000	13	80
SRS	Cs137	>1200	4	99
LANL	U238	>200	112	97
New Brunswick	Th232 Ra226 U238	5000		55
SNL (1998)	U238	662	54	99
Pantex	U238	148	50	57

Sandia National Laboratory Example

The technology was used at Sandia National Laboratory under the ITRD Program in 1997 to process 1270 cubic yards of soil located in four piles and in supersacks.

Contam.	Remediation Goal pCi/g	Reg. Screening Level pCi/g	Volume Reduction (%)	Pretreatment Activity pCi/g	Volume (cu yd)
U	550	275	98	660	50
Th	5 (total)	2.4	56	30	350
Cs	25	30	98	200	160
Pu	400	160	71	270/1100	710

- ➢ Overall volume reduction was 72%.
- ➢ Costs were $160,000.
- ➢ Operational costs were $75/cu yd; total costs were $150/cu yd.
- ➢ Overall cost savings = $600K because offsite disposal costs were $988/cu yd. By reducing the volume by 791 cu yd $745,000 in offsite disposal costs were saved.
- ➢ Cleanup criteria were based on risk-based calculations with 15 mRem/yr as an acceptable exposure level and a future industrial-use scenario.